

# CLAIMS

1. A method for making a plate-like fibre-reinforced composite product to be used as building or packing material, the method comprising
  - placing fibres on a lower laminate,
  - 5       applying a foaming hardening binding agent in liquid form on the fibres so that the fibres are surrounded by the binding agent,
  - transferring the fibres with binding agent between the lower laminate and an upper laminate between lower and upper pressing plates arranged to rotate endlessly on the upper, respectively the lower, side of the fibres with the
  - 10       binding agent so that the fibres with the binding agent are transferred by means of the rotation speed of the pressing plates, allowing the binding agent to foam up, expand and harden between the upper and lower pressing plates, and
  - removing the laminates from the hardened product, **characterized**
  - 15       **by the steps of**
    - preparing the fibres into a three-dimensional cohesive fibre mat of fibres bound together, the thickness of which basically ranges between 0.5 and 0.8 mm and the width between 0.3 and 2 mm, and the length of at least 80% of
    - 20       the fibres is at least 100 mm before the binding agent is applied onto the fibre mat,
    - providing the fibre mat with a moisture content of 5% at the most before the binding agent is applied onto the fibre mat,
    - applying the binding agent onto the fibre mat so that a mixture of fibre mat and binding agent is obtained, the mixture comprising fibres close to
    - 25       the upper surface thereof, which is turned against the upper pressing plates, and close to the lower surface thereof, which is turned against the lower pressing plates,
    - endlessly rotating the lower and the upper laminate between which the mixture of fibre mat and binding agent is guided, and
    - 30       placing the mixture under a pressure of at least 0.8 bar and 5 bar at the most and allowing, before the laminates are removed, the mixture to harden into a plate-like product having a thickness of 10 to 150 mm and comprising fibres close to the upper surface thereof and close to the lower surface thereof when transferring the mixture between the pressing plates.

2. A method as claimed in claim 1, **characterized** in that the thickness of the fibre mat before applying the binding agent thereto is approximately 1.5 to 3 times the thickness of the final product.

3. A method as claimed in claim 1, **characterized** in that the  
5 fibre mat is made of hygroscopic fibres.

4. A method as claimed in claim 1, 2 or 3, **characterized** in that the foaming binding agent is applied onto a fibre mat having a moisture content of 3% at the most.

5. A method as claimed in claim 1, **characterized** in that the mixture of fibres and binding agent is subjected to a pressure of 1 to 2 bar at the most.

6. A method as claimed in claim 1, **characterized** in that a material with a good adhesiveness is used as binding agent.

7. A method as claimed in claim 4, 5 or 6, **characterized** in  
15 that polyurethane is used as binding agent.

8. A method as claimed in claim 6, **characterized** in that a phenol-based material is used as binding agent.

9. A method as claimed in claim 1 or 7, **characterized** in that the fibres comprise wood fibres.

20            10. A method as claimed in claim 7, **characterized** in that  
the fibre mat including the polyurethane is transferred between the pressing  
plates at a temperature ranging between 30 and 90 degrees Celsius.

11. A method as claimed in claim 11, **characterized** in that the binding agent is applied onto the fibre mat by means of spray nozzles.

25 12. An apparatus for making a plate-like fibre-reinforced composite product to be used as building or packing material, the apparatus comprising an inlet end (10) for receiving fibres surrounded by binding agent, an outlet end (11) for providing the plate-like fibre-reinforced composite product manufactured in the apparatus,

an upper endlessly rotating belt (1) comprising a plurality of upper pressing plates (3), which controlled by at least two elongated control elements (32) extending in the longitudinal direction of the apparatus are arranged to move on an upper endless track, and a lower endlessly rotating belt (2) comprising a plurality of lower pressing plates (4), which controlled by at least two elongated control elements (32) extending in the longitudinal direction of the apparatus are arranged to move on a lower endless track, whereby the upper

elongated control elements (32) extending in the longitudinal direction of the apparatus are arranged to move on a lower endless track, whereby the upper pressing plates within an area of the upper endless track are arranged on a first substantially flat plane and the lower pressing plates within an area of the lower endless track are arranged on a second substantially flat plane, which is parallel to the first flat plane, whereby the upper and lower pressing plates within the area are arranged to transfer the fibres surrounded by the binding agent between them,

feed means (13 to 16, 18 to 21) for feeding an upper laminate (12) and a lower laminate (17) in said area, the upper laminate (12) is arranged to be supported in said area against the upper pressing plates (3) and to move at the same speed as the upper pressing plates, and the lower laminate (17) is arranged to be supported in said area against the lower pressing plates (4) and to move at the same speed as the lower pressing plates,

collecting means (13 to 16, 18 to 21) for collecting the upper and lower laminate (12, 17) from the plate-like composite product manufactured in the apparatus,

application means (24) at the inlet end (10) for applying fibres including binding agent in liquid form onto the lower laminate (17), and

heating means (30, 31) for heating the mixture of fibres and binding agent, **characterized by**

the length of said area being 5 to 30 m and the width thereof 1 to 5 m,

the apparatus comprising pressing means (9) for creating a pressure of at least 0.8 bar towards the pressing plates (3, 4),

the upper pressing plates (3) of the apparatus being arranged at a distance of 10 to 150 mm from the lower pressing plates (4), and

said feeding means being adapted to rotate the upper laminate (12) and the lower laminate (17) in endless paths.

13. An apparatus as claimed in claim 12, **characterized** in that the pressing plates (3, 4) comprise a flat surface turned against the laminates (16, 17) and gripping parts (38) to co-operate with endless drive elements (35) belonging to the feed means that are arranged to be controlled by the control elements (32).

14. An apparatus as claimed in claim 12, **characterized** in that the upper and lower laminate (17) is made of polyethylene foil.

15. An apparatus as claimed in claim 12, **characterized** in that the application means comprise at least a spray nozzle (24) arranged to sweep back and forth in the transverse direction in relation to the longitudinal direction of the apparatus.

5           16. An apparatus as claimed in claim 12, **characterized** in that the heating means (30, 31) comprise heating means arranged to heat the upper and lower pressing plates (3, 4) to a temperature ranging between 30 and 100 degrees Celsius.

10           17. A plate-like fibre-reinforced composite stable product comprising fibres surrounded by a binding agent to be used as building or packing material, the composite product comprising fibres close to the upper and lower surface of the product, **characterized** in that

the fibres are in a form resembling a three-dimensional cohesive mat,

15           the thickness of the fibres mainly ranges between 0.5 and 0.8 mm and the width between 0.3 and 2 mm, and the length of at least 80% of the fibres is at least 100 mm,

the weight ratio between fibres and binding agent ranges between 0.8 and 2 and that the thickness of the plate-like product is 10 to 150 mm..

20           18. A plate-like fibre-reinforced composite product as claimed in claim 17, **characterized** in that the binding agent is polyurethane.

19. A plate-like fibre-reinforced composite product as claimed in claim 18, **characterized** in that the product is not covered.